ENVIRONMENT PROTECTION BOARD

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BUILDING A GAS PIPELINE THROUGH THE ARCTIC

What Will Be the Environmental Impacts?

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The Project

The proposed Mackenzie gas pipeline is a gigantic project by Canadian or even world standards. Intended to carry natural gas from the Mackenzie Delta and the Alaska North Slope to markets in Canada and the United States, the 48-inch pipeline would be 2600 miles long and cost an estimated $8.3 billion to build. It could be carrying gas by the summer of 1980.

Project activities could start in the summer of 1977, with the first pipe being laid in the winter of 1978. The pipeline would be built during three winter construction seasons — winter being the time during which the ground is less susceptible to damage. The line would have a capacity of 4.5 billion cubic feet of gas a day — enough to heat 35,000 Canadian homes for an entire year.

The proposed pipeline originates in gas fields at Prudhoe Bay, Alaska and Taglu Pool on Richards Island in the Beaufort Sea. Supply lines from these locations link up at Travaillant Lake to form a main line which follows the Mackenzie River to Fort Simpson, and then continues south to a terminus at Caroline, Alberta. From Caroline, delivery lines transport gas to markets in the United States and Canada.

The project is being proposed by Canadian Arctic Gas Pipeline Limited, a consortium of 25 major oil, gas and utility corporations in the U.S. and Canada. The consortium has applied to the Canadian Government for permission to build the pipeline. Information on these two pages is drawn from this application.

This brochure summarizes the Environment Protection Board's impact assessment of the portion of the pipeline project in the Yukon and Northwest Territories. It presents an overview of the major potential causes of impact and of their possible effects on the northern environment.

CANADIAN ARCTIC GAS STUDY LIMITED

North of the sixtieth parallel the pipeline is to be buried in a ditch 7 feet wide and 8 feet deep, under at least 2½ feet of fill. After the ditch has been backfilled a spoil crown of excavated material would be spread on top to allow for settling.

R. READ

About 30 million cubic yards of borrow material may be excavated from borrow pits and riverbeds along the route. Borrow material will be used for roads and airstrips, compressor station pads, concrete aggregate, and backfill for the pipeline in selected areas.

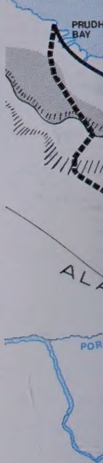
COVER PHOTO: CANADIAN ARCTIC GAS STUDY LIMITED

A right-of-way 120 feet wide would be cleared along the length of the pipeline. Although clearing would normally be carried out by bulldozers equipped with vee or Rome-type cutting blades, hand clearing is to be employed when machine clearing would produce detrimental environmental consequences.

K. ADAM

The project calls for some 2½ million tons of steel pipe. Walls of the pipe are to be three-quarters of an inch thick to withstand operating pressures of up to 1700 pounds per square inch.

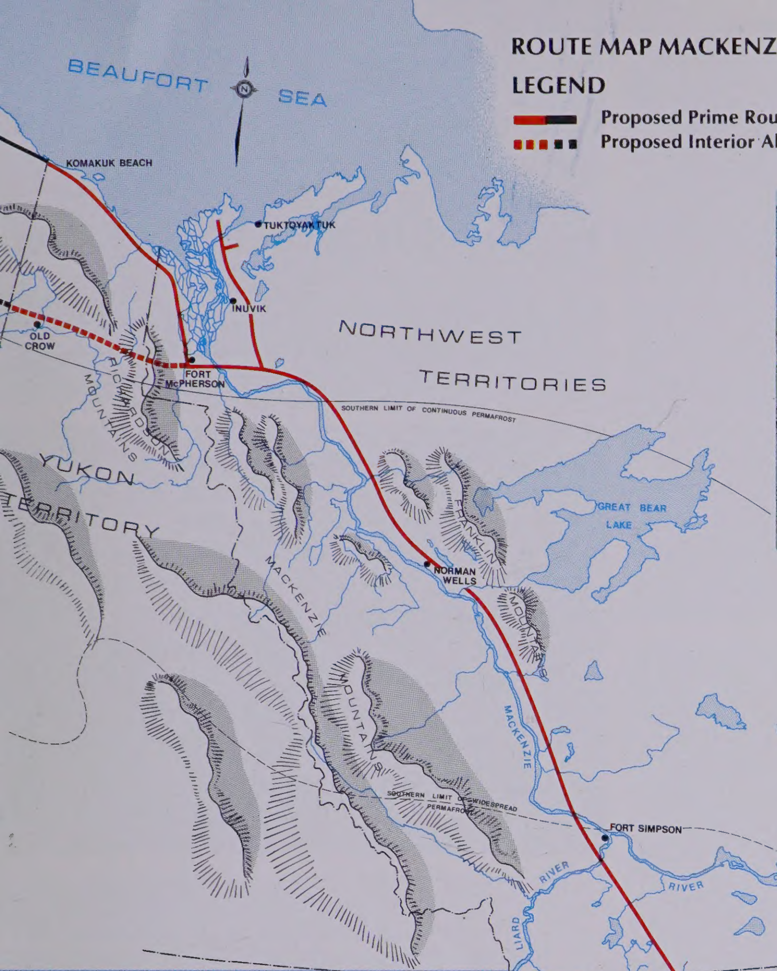
CANADIAN ARCTIC GAS STUDY LIMITED

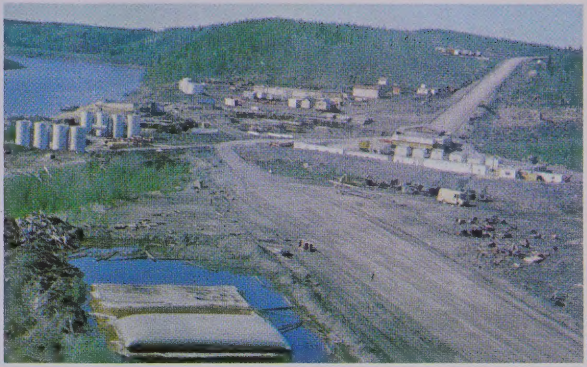


ROUTE MAP MACKENZIE GAS PIPELINE

LEGEND

▬ Proposed Prime Route
▪▪▪ Proposed Interior Alternate Route




R. READ

Work force requirements for pipeline construction will peak at 7500 over two winter construction seasons. Once the pipeline is built, it will take 450 personnel to operate and maintain it.

G. CALEF

Over 400,000 tons or 10 million barrels of fuel would be consumed to build the pipeline. Storage facilities may include fuel bladders such as the ones shown here.

CANADIAN ARCTIC GAS STUDY LIMITED

By the time the pipeline is operating at full capacity, over 50 compressor stations would be spaced at 50-mile intervals along the route. Beside a typical station, noise levels could reach 75 decibels—slightly less than the noise of traffic on a busy city street.

H. HERNANDEZ

Forty-eight barges and eight tugs would be required in addition to the present fleet to ferry equipment, materials, and fuel down the Mackenzie River and along the Arctic coast. Helicopters, transport and STOL aircraft would fly in personnel and supplies during construction, and later conduct inspection and maintenance patrols of the completed line.

K. ADAM

Spray bar applications of water to an ice road. Construction activities would necessitate the transportation of over 3½ million tons of supplies, part of which would be transported over winter roads built specifically for the project.

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The Assessment in Summary

Since September 1970, the Environment Protection Board has been assessing the environmental impact of the northern natural gas pipeline proposed by Canadian Arctic Gas Study Limited. Its studies have involved field investigations of major environmental components and analysis of the requirements for regulating this large-scale construction project.

The Board has found that the Project's overall damage to the environment could be held to an acceptable level if certain methods and times of construction were employed, but that present inadequacies of both the Applicant's exhibits, and the Government's regulation and enforcement mechanism make it unlikely that damage will be held to this acceptable level. These inadequacies can be eliminated by acceptance of recommendations such as are made herein, but not without possible time delays to the Project. And the Project would still have unavoidable environmental costs such as damage to wilderness and native culture.

Our opinion is that the Applicant's proposed Project is only conditionally acceptable from an environmental point of view.

In the final analysis, acceptability of the gas pipeline project cannot, and will not, be based solely on environmental grounds. In the overall sense acceptability of the Project will be defined differently by various segments of society and out of these conflicting views those charged with the responsibility must come to a decision. This Board, while it has individual and collective views on the full range of economic, social, environmental and other issues, offers no appraisal of what is acceptable or unacceptable in the total Project. Rather, it confines its judgments on acceptability to changes in the environmental component.

The Impacts

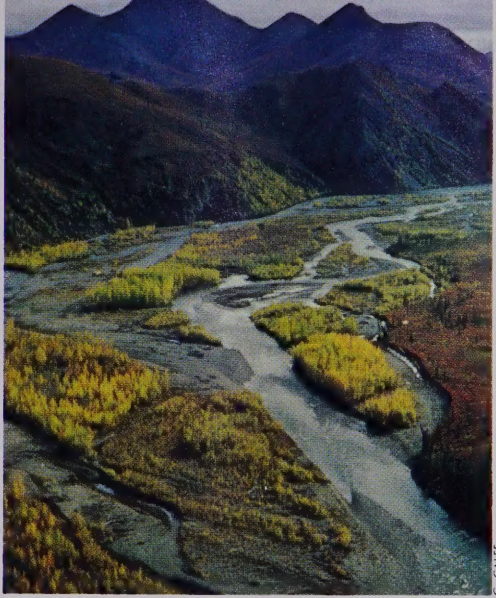
What Environmental Impacts Can Be Expected from the Project?

This very broad question demands a series of answers, some concerning individual and some collective aspects of the environment. Even though the impacts on different aspects of the environment are usually interrelated, for the sake of this presentation we have divided our comments into 12 separate categories:

- —Impact on the Limited Supply of Land in Its Natural State
- —Impact on Northern Peoples
- —Impact on Birds
- —Impact on Mammals
- —Impact on Fishes
- —Impact on Vegetation
- —Impact on Archaeological Resources
- —Impact on Air
- —Impact on Water
- —Impact on the Terrain
- —The Total Impact of This Project
- —The Cumulative Impact of This Project and Those That Will Follow.

To predict environmental impact the Board studied the Applicant's project description and its proposals to protect the environment. The Board also considered the laws and regulatory mechanisms which would apply to the proposed operations and attempted to judge the chances of success of Government and the Applicant in achieving environment protection. Where these mechanisms were not provided in detail we have recommended certain actions be taken. *Our environmental impact predictions assume that the recommendations contained hereunder will be implemented — otherwise the predictions and our conclusion may be invalid.*

G. CALEF



G. CALEF

G. CALEF

G. CALEF

W. CAMPBELL

What Will Be the Impact on the Limited Supply of Land in Its Natural State?

One of the greatest environmental impacts of the Project is that it will set off a major invasion of wilderness which will gradually reduce the supply of land in its natural state.

By itself the Project will have a relatively minor effect on the wilderness. North of the 60th parallel it will scar the land with a right-of-way 120 feet wide and 1,350 miles long. It will bring to previously undisturbed areas the noise and activity of 8,000 men and 3,000 major pieces of equipment. By its roads and rights-of-way it will render the land more accessible to those who come later. It will also stimulate "spin-off" development in transportation, recreation, and industry, as does any large project. But most important, these also will bring along other major projects and hence the invasion of wilderness by more men and more machines.

What is needed now is a new attitude towards development. We must cultivate the attitude that it is necessary to weigh the need for preserving environments in their natural state for future generations when considering developments of only immediate benefit.

CANADIAN ARCTIC GAS STUDY LIMITED

Northerner on Canadian Arctic Gas Study Limited's test site at Sans Sault, Northwest Territories.

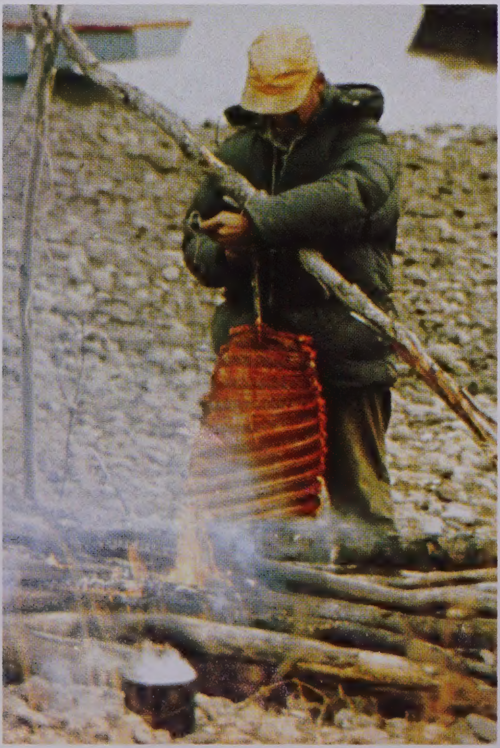
What Will Be the Impact on Northern Peoples?

Provided there is a settlement of the land claims issue before pipeline construction starts, we believe that the short-term impact of the pipeline on northern native people will be positive and that the degree of its beneficial effects will generally correspond to the skill of management of the company and the regulatory bodies and the natives themselves. The long-term impact will be that industrialization will change the lifestyle and identity of the people. This will be considered positive by some and negative by others. For other northern people who are accustomed to a wage economy, the pipeline will generally be accepted as positive.

The building of a highway and pipeline will set in motion the industrial opening of the North and the apparent decision to use the natural resources of the North to satisfy the needs of the South. In the ensuing process, native northerners will be offered many new jobs, they will be presented with new life patterns, and they will develop new aspirations, all of which will result in a gradual but eventually drastic departure from their long-built identity. The question as to the sort of impact this will have on them in the long term is open to many possible answers, none of which would probably be totally confirmed by history, both because of man's adaptability to change and the certainty of his social and cultural evolution.

The operation of the pipeline will directly create two hundred permanent jobs. These jobs will become available 3 years after construction has started and the Applicant intends to use those 3 years to intensify its training programs to prepare natives professionally and technically to fill the permanent jobs.

The common and basic attitude towards the pipeline regularly expressed by individual native persons, stated and restated by their elected representatives in recent years, strongly suggests that the reaction of the native people will remain negative as long as their land claims are not settled.



G. CALEF

The relationship of people to the natural environment is an integral part of the native culture.

G. CALEF

Charlie Thomas — Old Crow, Yukon Territory.

What Will Be the Impact on Birds?

This pipeline has the potential for some unavoidable, and a large number of avoidable, effects on bird populations through disturbance by aircraft, construction activities, and human presence; pollution; habitat destruction; and direct mortality. Many conflicts can be reduced or eliminated by proper route and facility location, and by management of construction practices and scheduling.

Uncontrolled aircraft traffic could disrupt normal staging activities of swans, geese, and ducks along the Mackenzie River during spring migration; it could disrupt normal nesting activities of swans and sandhill cranes in the outer Mackenzie Delta and geese, ducks, loons, and raptors in all regions; it could disrupt normal molting activities of ducks along the Yukon coast; and it could disrupt traditional fall staging and reduce premigration energy storage reserves of snow geese along the Yukon coast.

Unregulated autumn barge traffic within the coastal lagoons of the Yukon coast could disturb thousands of molting ducks.

The disturbance by construction activities and human presence could affect nesting raptors, particularly peregrine falcons, and it could disrupt traditional colonial nesting colonies of black brant, eiders, gulls, and terns, or traditional fall staging of snow geese on the Yukon coast.

Land requirements of the Project represent a small fraction of available bird habitat. However, loss of critical raptor nesting habitat; of the Yukon coastal barrier beaches, spits, lagoons, estuaries, and offshore islands; or of the Mackenzie River islands and sandbars, would constitute an unacceptable habitat loss.

Large fuel spills into the Mackenzie River, the Mackenzie Delta, or the Beaufort Sea have the potential for wide-spread and large-scale destruction of waterbirds and their habitat.

The noise of operating compressor stations on the Yukon Coastal Plain could alter traditional use of the area as a feeding and staging area by snow geese.

B. DAVIES

A half-grown peregrine falcon chick at a nest in the Richardson Mountains screams at a biologist who is about to band it.

J. JACOBSON

Coastal spits and lagoons provide refuge and feeding areas for molting waterfowl and seabirds, and resting places for geese during fall staging. Gulls, terns, and sea ducks nest on spits and beaches.

J. JACOBSON

Barge traffic on the Mackenzie River

Adult snow geese.

W. CAMPBELL

Snow geese on spring migration.

W. CAMPBELL

What Will Be the Impact on Mammals?

The construction and operation of the Project will reduce some mammal populations through direct destruction of habitat, and through increased killing and harassment by employees of construction and pipeline companies and also by those gaining access to hitherto inaccessible areas via the pipeline route and its associated facilities. Disturbance from normal pipeline construction noise and the accidental introduction of pollutants into the ecosystem also have potential for unavoidable damage.

Caribou could be seriously affected. As a worst case example, if no regulations are adopted, or if regulations are inadequate or even excellent but poorly enforced, the Porcupine caribou herd could be seriously depleted within 5-10 years.

CANADIAN WILDLIFE SERVICE

M. HOEFS – YUKON GAME DEPARTMENT

Caribou would be particularly susceptible to shooting along the corridor, to low-level aircraft flights, to blasting or other disturbing activity near calving or post-calving herds, and to obstructions and noise from construction when the migrating herds reach the vicinity of the right-of-way.

The Dall sheep, especially the Mt. Goodenough or Canning River populations, may decline owing to noise disturbance and increased hunting.

G. CALEF

Marine mammals in Kugmallit Bay and along the Arctic coast, as well as muskrat and beaver in freshwater regions, will be particularly vulnerable to oil spills that are certain to occur.

Regulations that prohibit hunting by pipeline personnel will also be necessary to prevent declines in the population of moose and other mammals.

A legally killed trophy.

G. CALEF

G. CALEF

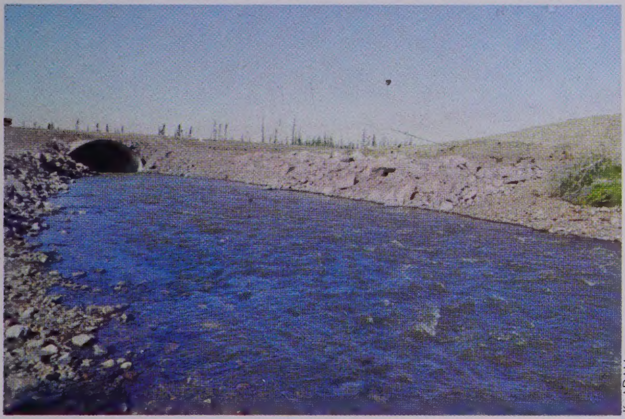
In treeless areas bears and wolves are vulnerable to harassment by aircraft.

The grizzly bear, polar bear, wolverine and wolf are vulnerable to excessive hunting and denning site destruction, and will be attracted by exposed edible refuse or strong food odors. Under the latter circumstance some will be killed in the guise of camp protection even though the Applicant's intention is not to do so.

What Will Be the Impact on Fishes?

The overall effect of construction and operation of the proposed gas pipeline on fishes will likely be minor. There is a probability for local, primarily short-term, and even some serious problems resulting from increased siltation and reduction in oxygen levels in some rivers and lakes, increased water velocities that interfere with fish movements, and accidental spills of toxic substances into watercourses. Long-term effects of fishing on this resource depend on the extent and success of future management of the stocks.

In areas where extensive culverting is necessary, special attention will be required to avoid both long- and short-term impacts. Culverts associated with roads along the route can, if improperly designed, create velocity barriers to fish.



K. ADAM

R. READ

Arctic Grayling

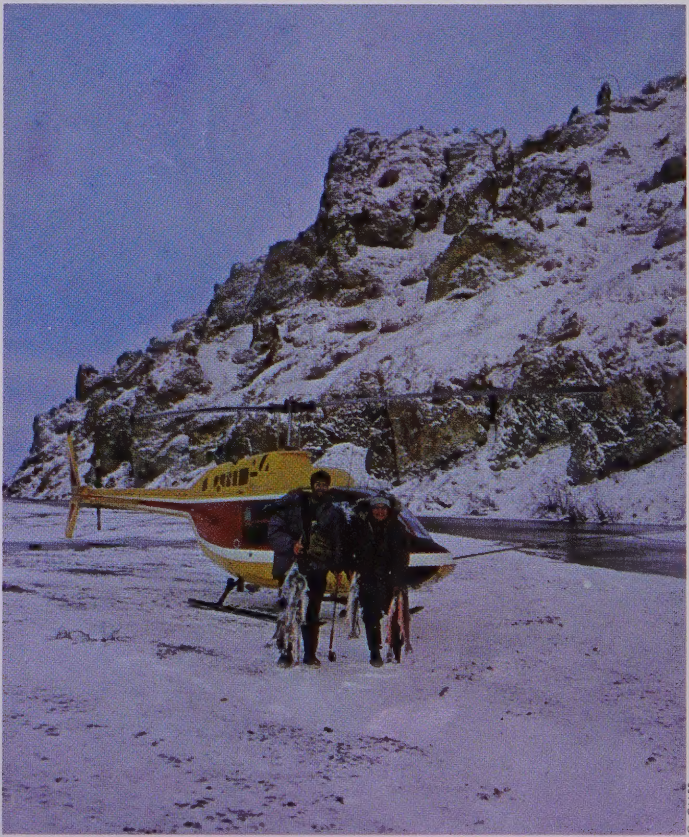
Many chemicals toxic to fish will be used in procedures associated with the proposed gas pipeline. Although none will be routinely introduced into watercourses, accidental spills will likely result in fish kills in the vicinity of the spills. Additional studies are required to determine the precise effects of dilute methanol pipeline pressure test fluid on fishes and aquatic systems.

ALBERTA GAS TRUNK LINE CO. LTD

Severe local impact during the construction phase may be expected in areas where extensive road construction takes place within a small watershed and where riverbanks are insufficiently protected at the site of pipeline river crossings.

Indiscriminate removal of gravel from active stream beds must be avoided to protect fish spawning beds.

Sport fishing will increase significantly as a result of increased access to the fish resource provided by pipeline facilities such as airstrips and roads. If records of statistics from sport fishermen were collected, the resulting knowledge gained about the resource would be an offsetting positive impact. Current human use of fish resources by people who utilize them for subsistence is not known well enough to make adequate judgements about long-term effects of the development on this resource.



G. CALEF

What Will Be the Impact on Vegetation?

Pipeline construction and associated activities will utilize about 50 square miles of vegetated terrain. Vegetation and terrain surface integrity will be totally destroyed along the pipeline ditch, at camp and yarding sites, airstrips, compressor stations, communication towers, permanent roads, and other permanent facilities. Vegetation will be partially destroyed and changed by winter roads, alteration of drainage, forest and tundra fires, SO_2 emissions, and summer off-road vehicle use for pipeline emergency repairs. Several proposed International Biological Programme (IBP) sites intended as ecological reserves will be crossed by the proposed pipeline thereby greatly reducing, if not destroying, the purpose for which they are to be set aside.

Fires characterize forested areas and also extend into tundra areas. The incidence of fire will probably increase during construction and operation of the pipeline, especially during summer activities, but so should the ability to detect and control these and fires of other origin. Fire in permafrost regions leads to deeper thaw, increases in the number of slumps on ice-rich slopes, and a significant loss of nutrients.

I. POWICK

H. HERNANDEZ

To our knowledge most plant species or communities which are rare or restricted in distribution along the proposed pipeline Prime Route along the Yukon coast or Interior Alternate are within proposed ecological reserves. Should there be other rare plant species known from only one or two sites, their ability to maintain themselves for any length of time is questionable. Where possible, attempts should be made to establish them in IBP sites. It is far more important, however, to be concerned with maintaining plant cover in general for the role it plays in the thermal regime, nutrient regime, soil stability, and wildlife habitat.

J. JACOBSON

Firth River Valley, Yukon coast, the central core of a major proposed IBP site to preserve representative ecosystems of the Arctic Coastal Plain and the British Mountains.

The proposed IBP sites should be left intact or boundaries expanded where pipeline activities enter or interfere with existing sites. If a large tract is set aside in Canada contiguous with the Arctic National Wildlife Range in Alaska, to preserve for future generations a diversity of arctic topography, habitats, and biota, the impact of the proposed pipeline would be reduced in the long run.

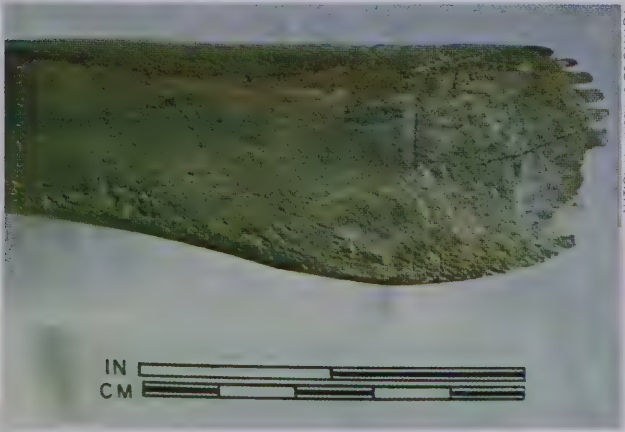
What Will Be the Impact on Archaeological Resources?

The impact on archaeological resources along the route will be proportional to the extent and effectiveness of the archaeological salvage program. An unknown number of sites will be damaged or destroyed. If an adequately staffed, well-planned and supported effort precedes and accompanies appropriate project activities, and provided that archaeologists are given the authority to effect minor route or site relocations, the Project will probably have a greater beneficial effect in the discovery of prehistoric evidence than negative effect in destroying it. An understanding of local cultural heritage in some areas may be permanently lost if the salvage responsibility of the Project is not accepted. A permanent impact on continental archaeological interpretation is unlikely.

Trenching will destroy sites but this could be offset by the value to the archaeological community of geologic and other data gathered from the 8-foot-deep, 1350-mile-long pipeline trench profile.

The tools and habitation of neolithic people, buried in the gravel, soil, and peat, constitute our only record of their prehistoric way of life and adaptation to the environment: this record is an easily destroyed and non-renewable national resource.

A. MYSKA



NATIONAL MUSEUMS OF CANADA

Scraper made from a caribou thighbone, found in Old Crow Flats. Dated 30,000 years ago, it is the oldest direct evidence of man in the New World.

An old eskimo house on the Yukon coast near the Firth River.

G. CALEF

What Will Be the Impact on Air?

Because the Project spans such a vast area, its effect on air quality is expected to be minimal. Local problems could develop, however, near compressor stations or during concentrated construction activity.

Air pollutants produced by the Project in quantities sufficient to suggest potential environmental effects are emitted from two sources: compressor stations; and construction equipment, including support vehicles.

CANADIAN ARCTIC GAS STUDY LIMITED

G. CALEF

A mature mat of lichens. One of the major winter food sources of caribou, lichens are sensitive to relatively low levels of sulphur dioxide (SO_2).

Even at a local level impact resulting from air pollutants from the proposed project will probably be minimal. However, in some areas which experience temperature inversions, for example, SO_2 contained in compressor station and vehicle exhaust could have a destructive effect on lichens.

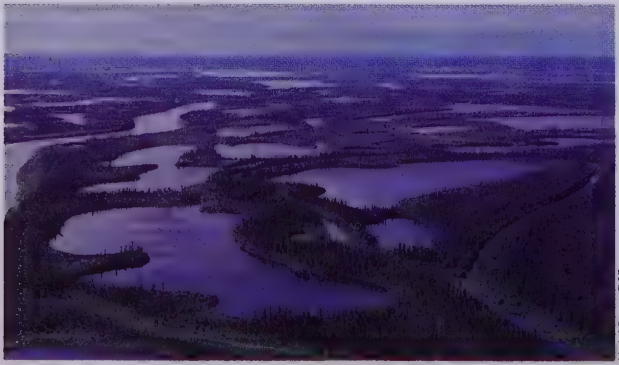
In general, impact resulting from airborne pollutants can be expected to be first manifested through a deterioration of plant life, even though snow cover may offer some protection to sensitive vegetation during construction.

What Will Be the Impact on Water?

In general, the Project will have little effect on regional water quality. In each region of the route some streams will experience measurable short-term increases in sediment load, but these will be mostly smaller streams, less than 50 cfs during spring runoff, and only rarely will the increases amount to an order of magnitude. In most streams increases in sediment load by an order of magnitude would result in concentrations much lower than those lethal to fish. Some damage to spawning grounds and aquatic food chains can be expected in streams where project-induced siltation is excessive or continuous.

Where increases in silt loads occur impact will result from increased turbidity of the water. Aesthetically this may be displeasing, but of more importance will be the reduction in the rate of photosynthesis and the resultant reduction in aquatic productivity.

K. ADAM



H. HERNANDEZ

Reduction in water quality will also result from the introduction into streams of toxic substances such as pipeline pressure test fluids. Such substances will have severe, damaging effects if, through accidental spills or large pipeline failures during testing, they are allowed to enter the aquatic environment in undiluted concentrations. In particular, the environmental impact of a large accidental discharge of oil or other toxic substance upstream or within the Mackenzie River Delta could be catastrophic.

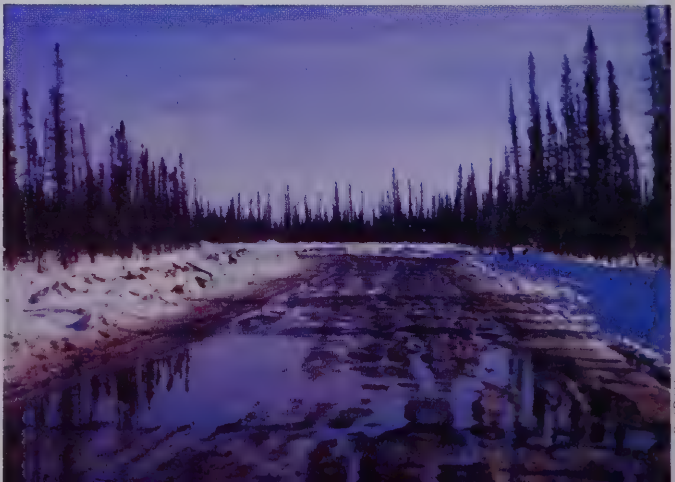
What Will Be the Impact on Terrain?

The impact on all properties of surfaces which characterize landscapes will be severe on the rights-of-way of the pipeline and access roads and at all construction sites for related facilities. The magnitude of impact will vary from the total and unavoidable terrain damage along the ditchline to the minor and potentially avoidable scarring of surfaces due to disruptions to the vegetation.

The major impact will be the alteration of geomorphic features through accelerated processes, of which erosion and deposition are of greatest short-term significance and potentially of long-term importance if mitigative measures are not rigorously and immediately employed. The intense cutting action of flowing water will produce both increased sheetwash and gullying whenever drainage alterations are induced and any destruction of the natural thermal insulation will initiate one or more of a host of geomorphic changes characteristic of permafrost terrain. These include slumping, avalanching, and solifluction during the warm season when disturbed slopes become subject to material movement over the permafrost table. Such slope failures will be most evident along the right-of-way and may be unusually severe at major river crossings. In areas of ice-rich permafrost all surface changes resulting in elevated ground temperatures will induce ice-melt and ground-subsidence, including creation of thermokarst topography.

The Applicant's scheduling of the winter construction period does not completely coincide with the available winter road season. Serious terrain degradation can be anticipated unless strict controls are enforced on the use of winter roads in the spring.

General ponding on the ice road ten days prior to final closure of test loop.



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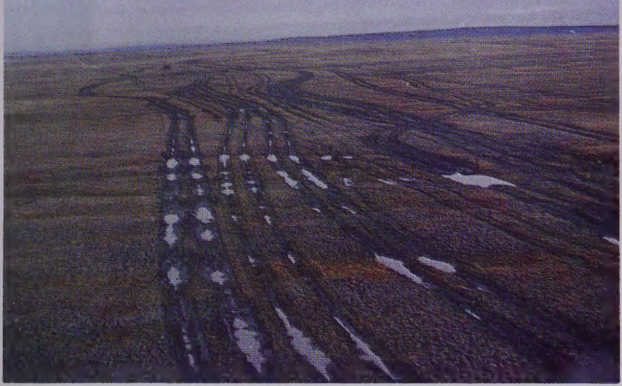
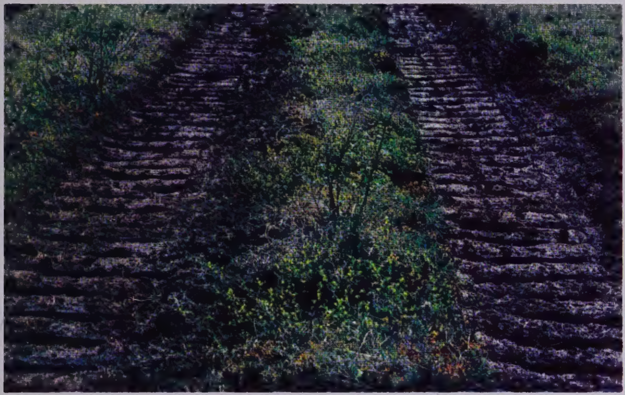


L. C. BLISS

The impact of off-road, off-right-of-way, all-terrain vehicles is avoidable and would be severe if it occurred. This is especially true on the tundra where visual scars are long-enduring and either compaction of vegetation and peat or scarring of these, can lead to serious thermal erosion. Unscheduled maintenance and emergencies, such as pipeline ruptures requiring summer use of heavy construction equipment, can cause damages that exceed many times over the terrain impacts of the initial construction.



H. HERNANDEZ

R. READ

There is no means of mitigating the aerial view of the right-of-way scar in forested areas nor the aerial or ground view of the tundra. These are irretrievable aesthetic losses for times to be reckoned in centuries.

R. READ

The importance of erosion develops from the inter-relationships of ground surface to vegetation, microclimates, soils, and other landscape features. The dynamic processes involved assure change in all components when any one is disrupted. Erosion processes, unless completely controlled, can be expected to initiate and maintain long-term sequences of terrain changes.

What Is the Total Environmental Impact of This Project?

It is certain that the total environmental impact of the Project will be greater than the sum of the individual impacts we have just considered. It is also certain that the total environmental impact of the Project cannot be established quantitatively.

The components we considered do not completely represent the environment along the route, however. They are only those which appear to be significantly affected. Even if we had considered the impact of the Project on a larger number of them, the sum of the impacts would probably still be less than the true total impact.

A seemingly small impact can eventually cause a disproportionately large environmental change. In this manner any project can have an overall impact on the environment greater than the sum of the immediate impacts.

R. READ

What Is the Cumulative Impact of This Project and Those That Will Follow?

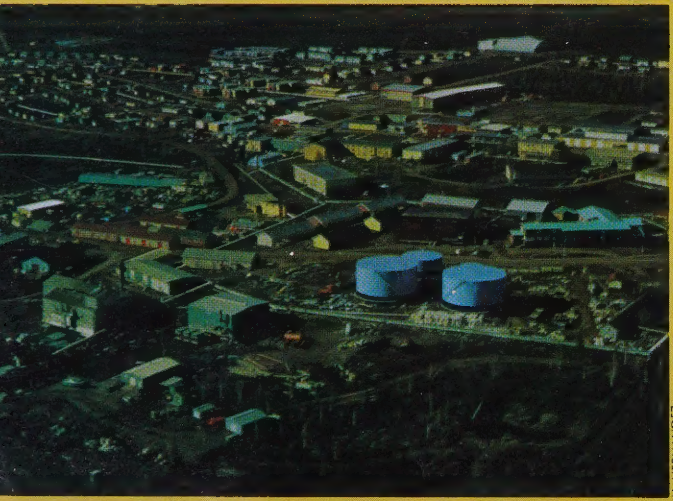
The cumulative impact of the Project on northern development will be of much more consequence to the environment than the construction and operation of the pipeline alone. The chain of developments that follows this Project and the Mackenzie Highway will produce a cumulative impact much greater than any single component of the chain.

Just as the discovery of oil at Norman Wells in the early 1920's brought oil exploration crews, the Canol pipeline and road, a refinery, an airport, and winter roads, so the gas pipeline and highway will bring other development. For instance, the highway will bring tourists, gas stations, and many of the other auxiliary facilities of the tourist industry. Other major developments such as mining will also be encouraged by the combination of a highway transportation system and the availability of energy.

Inevitable consequences of the approval of a gas pipeline include increased access, natural gas gathering systems, and gas processing plants. In addition, there is a possibility that gas wells will be developed in the Beaufort Sea and that discovery of significant oil quantities will necessitate an oil gathering system and oil pipeline.

The overall effect of this chain of events is that other major facilities will become "justifiable." Hydropower development and power lines will be needed. Even the possibility of a railroad system could be reviewed.

Our concern about cumulative impact becomes more meaningful when the gas pipeline and Mackenzie Highway of the western Arctic and Subarctic are thought of as massive projects similar in impact to Canada's first railway to the West. At that time, would not one have been justified in expressing concern about native claims, about buffalo herds, about land in its natural state? Did the native people get a fair land claim? Where are the buffalo? And where are the large tracts of grassland wilderness?



H. HERNANDEZ

J. JACOBSON

H. HERNANDEZ

BUT IT TAKES MORE than an environmental impact assessment to protect the environment. An assessment only shows what environmental impacts can be expected from a project, not what must be done to achieve environment protection. Also it is a useful tool to present the environmental issues of a project to the policy makers and the public so that an informed decision can be made as to whether or not the project should receive approval. What it takes are prohibitions, restrictions, and specific actions, based on what the assessment has brought to light, to achieve environment protection.

As a result, the Environment Protection Board, after preparing its impact assessment of the Project, recommended the protection measures it considers necessary if the Project is approved. These measures are summarized below:

Applicant

We recommend that the Applicant must table specific plans, specifications, and the details of an organizational structure to administer the plans and specifications, which demonstrate it will protect the environment. In addition, the Applicant must table the conditions of contract, performance bonds, and penalties that will apply to its contractors for failure to comply with environmental protection measures.

We recommend that the Applicant be required to submit to the proper authority for review its formal program for environmental training of project personnel, including a schedule, before approval of the application.

We recommend the Applicant supervise and be accountable for the environment protection measures through the same Resident Manager that supervises the engineering and economic requirements of the Project.

Public

We recommend that the Public be kept informed about the Project through establishment of an Environmental Auditor Group that is clearly independent of Government, and the Pipeline Company and its contractors.

Government

We recommend that the Government formulate a land use plan for the western Arctic, as well as an Environmental Code and temporary Agency specifically for this Project.

We recommend that the Government establish an Environmental Code specifically for this Project.

We recommend that an Environmental Code for this Project be explicit about the performance of the Applicant and about the system for administering the Code.

We recommend that Government have a single agency for this Project that represents all aspects of government interest, including environment protection.

We recommend that the Government's regulatory agency plan and provide an environmental training program for all its staff.

We recommend that the Government formulate a land use plan for the western Arctic regardless of the outcome of this Project.

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In 1970 the Environment Protection Board began studying effects on the natural environment of construction and operation of a natural gas pipeline through the Yukon and Northwest Territories. The study involves collecting baseline data, incorporating environmental planning into pipeline design, assessing impact, preparing guidelines for education and control of construction personnel and evaluating post-construction activities. The Board, now sponsored by Canadian Arctic Gas Study Limited, is composed of specialists in arctic research or environmental science.

The Board, an autonomous body, is guided by the following objectives:

1) To become sufficiently familiar with arctic ecosystems in the area of pipeline operation to permit estimates of biological costs or benefits of construction and judgments about the potential for widespread damage or major disruption of ecosystems.
2) To become sufficiently familiar with biological and physical environments so that pre-construction findings can be used as a basis for post-construction evaluation.
3) To make recommendations and conduct briefings so that results of the Board's deliberations can be used for maximum environmental protection.
4) To make available results of its studies as a direct contribution toward northern scientific development.

The Board's deliberations are to continue throughout the life of the proposed four-year construction project and for a suitable period during the operational phase.

Members of the Environment Protection Board are: Mr. C.H. Templeton (Chairman), Dr. L.C. Bliss, Dr. M.E. Britton, Mr. D.W. Craik, Mr. E. Gourdeau, Dr. I. McTaggart-Cowan, Dr. S. Thomson, Dr. N.J. Wilimovsky and Mr. R.C. Isaak (Secretary).

Outside specialists are used for specific assignments. Administrative support for the Board is supplied by Interdisciplinary Systems Ltd., 528 St. James Street, Winnipeg, Manitoba.

The summary, impacts, and recommendations in this brochure are excerpts from Volume I of the Board's report "Environmental Impact Assessment of the Portion of the Mackenzie Gas Pipeline from Alaska to Alberta" published in September 1974. The report comprises four volumes:

Volume I:	The Board's Opinion
Volume II:	Toward's An Environmental Code
Volume III:	Environmental Atlas
Volume IV:	Research Reports

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